

is Eclipsed, for it alwayes passes between the lines 1 2, and 3 4.

To which I say, That if the Air be such, as I have newly shewn it to be, and consequently cause such an inflection of the Rays that fall into it, those dark *Penumbra's* FYZQ, HXVT, and ORPS, will all vanish. For if we suppose the Air indefinitely extended, and to be no where bounded with a determinate refracting surface, as I have shewn it incapable of having, from the nature of it; it will follow, that the Moon will no where be totally obscured, but when it is below the Apex N, of the dark blunt Cone of the Earth's shadow: Now, from the supposition, that the Sun is distant about seven thousand Diameters, the point N, according to calculation, being not above twenty five terrestrial Semidiameters from the Center of the Earth: It follows, that whensoever the Moon eclipsed is totally darkned, without affording any kind of light, it must be within twenty five Semidiameters of the Earth, and consequently much lower then any Astronomers have hitherto put it.

This will seem much more consonant to the rest of the secondary Planets; for the highest of *Jupiter's* Moons is between twenty and thirty *Jovial Semidiameters* distant from the Center of *Jupiter*; and the Moons of *Saturn* much about the same number of *Saturnial Semidiameters* from the Center of that Planet.

But these are but conjectures also, and must be determin'd by such kind of Observations as I have newly mention'd.

Nor will it be difficult, by this *Hypothesis*, to save all the appearances of Eclipses of the Moon, for in this *Hypothesis* also, there will be, on each side of the shadow of the Earth, a *Penumbra*, not caus'd by the Refraction of the Air, as in the *Hypothesis* of *Kepler*; but by the faint inlightning of it by the Sun: For if, in the sixth Figure, we suppose ESQ, and GSR, to be the Rays that terminate the shadow from either side of the Earth; ESQ coming from the upper limb of the Sun, and GSR from the under; it will follow, that the shadow of the Earth, within those Rays, that is, the Cone GSE, will be totally dark. But the Sun being not a point, but a large area of light, there will be a secondary dark Cone of shadow EPG, which will be caus'd by the earth's hindring part of the Rays of the Sun from falling on the parts GPR, and EPQ, of which halved shadow, or *Penumbra*, that part will appear brightest which lyes nearest the terminating Rayes GP, and EP, and those darker that lye nearest to GS, and ES: when therefore the Moon appears quite dark in the middle of the Eclipse, she must be below S, that is, between S and F; when she appears lighter near the middle of the Eclipse, she must pass some where between RQ and S; and when she is alike light through the whole Eclipse, she must pass between RQ, and P.

Observ.

Observ. LIX. Of multitudes of small Stars discoverable by the Telescope.

HAVING, in the last Observation, premis'd some particulars observable in the medium, through which we must look upon *Celestial* Objects, I shall here add one Observation of the Bodies themselves; and, for a specimen I have made choice of the *Pleiades*, or seven Stars, commonly so called (though in our time and Climate there appear no more then six to the naked eye) and this I did the rather, because the deservedly famous *Galileo*, having publish'd a Picture of this *Asterisme*, was able, it seems, with his Glas to discover no more then thirty six, whereas with a pretty good twelve foot Telescope, by which I drew this 38 *Iconism*, I could very plainly discover seventy eight, placed in the order they are ranged in the Figure; and of as many differing Magnitudes as the *Asterisks*, wherewith they are Marked, do specify; there being no less then fourteen several Magnitudes of those Stars, which are compris'd within the draught, the biggest whereof is not accounted greater then one of the third Magnitude; and indeed that account is much too big, if it be compared with other Stars of the third Magnitude, especially by the help of a Telescope; for then by it may be perceiv'd, that its splendor, to the naked eye, may be somewhat augmented by the three little Stars immediately above it, which are near adjoyning to it. The Telescope also discovers a great variety, even in the bigness of those, commonly reckon'd, of the first, second, third, fourth, fifth, and sixth Magnitude; so that should they be distinguish'd thereby, those six Magnitudes would, at least, afford no less then thrice that number of Magnitudes, plainly enough distinguishable by their Magnitude, and brightness; so that a good twelve foot Glas would afford us no less then twenty five several Magnitudes. Nor are these all, but a longer Glas does yet further, both more nicely distinguish the Magnitudes of those already noted, and also discover several other of smaller Magnitudes, not discernable by the twelve foot Glas: Thus have I been able, with a good thirty six foot Glas, to discover many more Stars in the *Pleiades* then are here delineated, and those of three or four distinct Magnitudes less then any of those spots of the fourteenth Magnitude. And by the twinkling of divers other places of this *Asterisme*, when the Sky was very clear, I am apt to think, that with longer Glasses, or such as would bear a bigger aperture, there might be discovered multitudes of other small Stars, yet inconspicuous. And indeed, for the discovery of small Stars, the bigger the aperture be, the better adapted is the Glas; for though perhaps it does make the several specks more radiant, and glaring, yet by that means, uniting more Rays very near to one point, it does make many of those radiant points conspic-

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